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**United States Department of Education**

**Student Financial Assistance**



**Integrated Technical Architecture  
Detailed Design Document**

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## 1 Introduction

### 1.1. Purpose

The Operations Architecture is a combination of tools and support services required to keep a production system up and running efficiently. Unlike the Execution and Development Architectures, its primary users are system administrators, production support, and service management personnel.

### 1.2. Scope

This document will address the tools defined as part of the operations environment for Release 1.0 of the Integrated Technical Architecture (ITA). The standards, guidelines, and procedures for using the tools as part of a standard Student Financial Assistance (SFA) methodology are not included within this document.

### 1.3. Approach

The approach used to define the operations architecture for the ITA was based on an analysis of the existing SFA monitoring tools in place at the Virtual Data Center (VDC) and ongoing operations management tasks. In concert with these existing tools, additional tools required to support applications within the ITA environment were identified.

## 2 Operations Architecture Overview

The Operations Architecture is the technology component of the Operations Infrastructure, which is the bundled set of people, process, and technology involved in Operations. As a result, the Operations Architecture framework below provides the tool or technology blueprint for an operations environment.

### 2.1. Operations Framework

The Operations Architecture Framework contains three main elements:

#### 2.1.1. Component Categories & Components

These are depicted in the middle and upper right element of the framework diagram. The categories shown represent a logical grouping of technology components based on industry drivers or interdependencies of the components. The six component categories are:

- Operations Integration Architecture Components
- Network/Systems Management Components
- Solution Availability Components
- Service Management Components
- Configuration Management Components
- Physical Site Management Components

Each of these categories has associated "Components" within them. Each component provides an operations architecture with specific functionality (e.g. a Service Desk component). Each component has been classified in only one component category even though it may have a tight interrelationship with components in other categories.

#### 2.1.2. Operations Data Architecture

This is depicted on the left side of the framework diagram. This represents where and how operations data is stored, how it is accessed and by whom, where it is used, and how it is distributed

#### 2.1.3. Operations Execution and Development Architectures

These are depicted along the bottom of the framework diagram. They represent the environments in which operations architecture components are developed, deployed, and operated as shown in the following diagram.

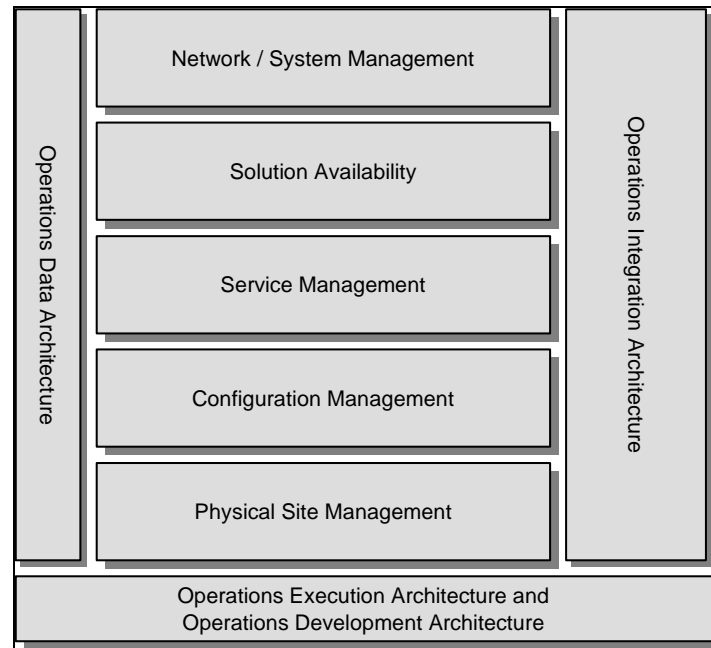


Figure 1 - Operations Architecture Framework

A brief description of the services provided by Operations Architecture is listed below:

- **Network/Systems Management** – Includes all components that monitor network and systems performance, process job activity, and diagnose and report failures. The technical architecture hardware and software components addressed by Network/Systems Management includes hardware and software in all Information Technology (IT) environments; Development, Testing, and Execution. In addition the actual IT architecture components include: facilities, hardware, operating system, system software, network, database, custom applications, and packaged applications.
- **Solution Availability** – Ensures availability of IT systems through back-up or redundancy strategies.
- **Service Management** – The Service Management Components include those components that assist the IT organization in providing quality IT service and support. Since Service Management is a process-oriented function it must be kept in mind that these Components address Service Management from only a technical perspective. Includes help desks, capacity planning, user administration, service level management.
- **Configuration Management** – Includes the components which help the IT Operations Environment understand and modify “what is where”. These components may either track information about an element configuration and “push or pull” data and software to an element. Information that needs to be tracked includes product licensing information, warranty information, vendor names, logical and physical device information, product configuration tracking, software and version levels, network configuration parameters, physical location, and accounting information.

- **Physical Site Management** -- Ensures that the physical environment is managed and protected against unplanned outages. The Physical Site Management Component Category applies to all environment architectures; Development, Testing, and Execution Components that may be implemented as part of this category include:
  - Uninterruptible Power Supply (UPS)/Generator
  - Raised Floor
  - Fire Suppression & Climate Control
  - Wiring/Cabling
  - Disaster Recovery
- **Operations Data Architecture** – Represents where and how operations data is stored, how it is accessed, where it is used, and how it is distributed. In many cases parts of the operations data architecture will be predefined by packaged operations architecture components that impose specific logical and/or physical data models. In addition, the operations data architecture is significantly impacted by the operations processes and organization as these dictate who needs access to data and how data will be used. As such, design and implementation of the operations data architecture should always involve teaming with process and organization implementation teams.
- **Operations Development and Execution Architecture** – The Operations Execution Architecture provides the run-time services required for Operations Architecture components to execute. It answers the question "What is the technology environment on which my operations architecture components will run?" Put another way, it is the "infrastructure" for operations architecture components. The Operations Development Architecture provides a unified collection of technology services, tools, techniques and standards for constructing and maintaining components of the operations architecture. It answers the question "What is the technology environment in which my operations architecture components are designed, built and maintained?"

## 2.2. Operations Architecture Tools Mapping

The following tables map the operations environment tools currently in use or scheduled to be deployed in the SFA operations environment. Each operations architecture component identifies the set of tools within the defined framework.

Table 1 – SFA Operations Environment Tools

Operations Architecture Services	Tools/Comments
Network/Systems Management	<p>Computer Sciences Corporation (CSC) is currently responsible for performing network/systems management at the VDC. The suite of tools that are currently in use will be required to support the network/systems management requirements of Release 1 of the ITA.</p> <p>In addition, the following tools will be used to support system management requirements of specific technical infrastructure applications:</p> <ul style="list-style-type: none"> <li>• Viador User Administrator Module</li> <li>• International Business Machines (IBM) WebSphere Administrative Console</li> <li>• IBM eNetwork Dispatcher Monitoring Tool</li> <li>• Informatica PowerCenter Server Manager &amp; Repository Manager</li> <li>• MicroStrategy Administrator</li> <li>• IBM MQSI System Administrator</li> <li>• MQSoftware Qpsal</li> </ul>
Solution Availability	CSC currently supports availability of systems located at the VDC
Service Management	TBD--Based upon identification of the organization that will provide Service Management capabilities for the ITA
Configuration Management	<ul style="list-style-type: none"> <li>• Rational Clear Case</li> <li>• cc:Harvest</li> <li>• Interwoven</li> <li>• Endeavor</li> </ul>
Physical Site Management	Physical Site Management will not be addressed within the scope of this document. CSC currently handles Physical Site Management for SFA at the VDC. For Release 1.0 of the ITA, the policies, procedures, and processes currently in place at the VDC will be sufficient to support the physical site requirements.
Operations Data Architecture	Oracle and DB2 are the standard Relational Database Management System (RDBMS) for storing operational data.
Operations Development and Execution Architecture	Refer to the Development and Execution Architecture sections of this document to identify runtime services required for the operational components of the technical architecture.



## 3 Internet Architecture Operations Environment

This section defines the operations tools as deployed to support the system building component of the framework as part of the ITA. The tools defined support the operations of applications within the Internet Architecture framework.

### 3.1. Viador User Administrator Module

The Viador User Administrator Module provides a toolset that allows an administrator to create and manage Viador E-Portal Suite users and their data access.

The administrator module provides the following capabilities:

- Start and Stop Viador Information Center Services
- Create Data Sources
- Create Viador E-Portal Suite users and setup user accounts
- Create Groups
- Assign Viador E-Portal Suite users to groups, and assign groups to groups
- Assign data sources to users
- Monitor Viador Portal Suite user sessions

#### 3.1.1. Starting and Stopping Viador Information Centers

Use the Server Administrator to start and stop Viador Information Center Servers. To stop Viador Information Center Servers, choose Shut Down Server from the Server menu or click the corresponding button. This action will halt all Viador Information Center Servers. Any users connected to Viador Portal Suite will be disconnected immediately.

To restart Viador Information Center Servers, choose Start Up Server from the Server menu or click the corresponding button.

#### 3.1.2. Infomanager Server Utility

The Infomanager server utility sends commands to the server. This utility will start a process and attach to the server so it can send commands to the server via the Transmission Control Protocol (TCP) / Internet Protocol (IP) socket connection.

The infomanager script is found in the following directory on the ITA server:

```
.../infospc/server/infomanager
```

The following command and syntax is used to invoke the Infomanager utility:

```
InfoManager [-confFile confFileName] [-instance instId] -commands
```

The configuration file name and the Viador Information Center (VIC) instance ID are optional parameters. Commands include:

Table 2 – Optional Parameters Commands

Command	Description
About	Display version/ configuration information about VIC
Start	Start VIC
Shutdown	Shut VIC down
Summary	Display VIC activity summary
Sessions	Display detailed portal session information
logout sessionId	Log out a portal session
setloglevel logLevel	Set log level

## 3.2 IBM WebSphere Administrative Console

The WebSphere Administrative Console is a Java program that provides the systems management interface for the WebSphere Application Server. The Help includes a tutorial on how to perform the primary tasks, help for dialogs, and help for input fields.

The administrative console is a main window from which operations support can complete tasks using the following resources:

- Enterprise applications - Configure applications comprised of Java components that work together to perform a business logic function. An enterprise application can contain enterprise beans, servlets, Hypertext Markup Language (HTML), JavaServer Pages (JSP) files, and Web applications. Applications can be started or stopped as a single unit, and create copies (clones) for workload management purposes.
- Web applications - Configure combinations of servlets, HTML, and JSP files into Web applications, allowing the management of the resources as a single unit.
- Application servers - Manage application server processes that enable the Web server to handle requests for applications containing enterprise beans and servlets.
- Enterprise beans and their containers - Deploy and manage entity and session beans, including their containers and database access.
- Servlet engines and servlets - Manage servlet engines that run within application servers to handle servlet requests.
- Files - Manage JSP files, HTML files, and Web resources.
- Nodes - Manage physical machines in the administrative domain.

In addition, the console can perform the following functions:

- Model and clone servers and other processes. That is, create and distribute copies of servers and applications for horizontal and vertical scaling.
- Route servlet requests to machines remote to the Web server. That is, configure "servlet redirectors" to route servlet requests to distributed applications, supporting workload management.
- Monitor usage and performance statistics for resources such as servers and servlets.
- Monitor transactions and force outcomes
- Connect to databases
- Establish and enforce security policies
- Provide personalization for the applications running on the Web site including user profile and session support
- Utilize virtual hosting to isolate applications and sites
- Monitor messages and initiate tracing
- Trace and debug distributed objects with Object Level Trace (OLT) and Object Level Debugging (OLD)

### **3.3. IBM WebSphere Component Broker System Administrative Console**

Component Broker (CB) provides a range of system management functions through a Graphical User Interface (GUI) tool. The GUI helps administer and operate the enterprise easily and effectively. The System Manager user interface displays and acts on the entities in the enterprise as system management objects.

For effective systems management, the systems and resources should be organized according to the business needs. For example, use the System Manager to do the following:

- Group the host computers into cells and workgroups.
- Configure the enterprise as one or more management zones to be managed as separate units. The hosts in the enterprise are automatically configured into one management zone, the network zone. Configure the business applications and the clients and servers needed into one or more other application management zones.
- Create alternative configurations of each management zone to provide support for changes in the business needs. For example, have configurations that support different applications or geographical areas, use different servers, or even use different host computers.
- Configure workload management of the applications across controlled server groups.
- Verify that the configurations are complete, properly defined, and ready for activation.

- Activate an entire configuration of a management zone with one action to update all or part of the business enterprise.

Use the Component Broker system management tool to operate the enterprise and to perform functions on run-time objects. For example:

- Start and stop individual servers and applications
- Display and act on the status of managed objects
- Display and change the attributes and relationships of managed objects
- Change workload management across server groups

The following diagram illustrates CB system management.

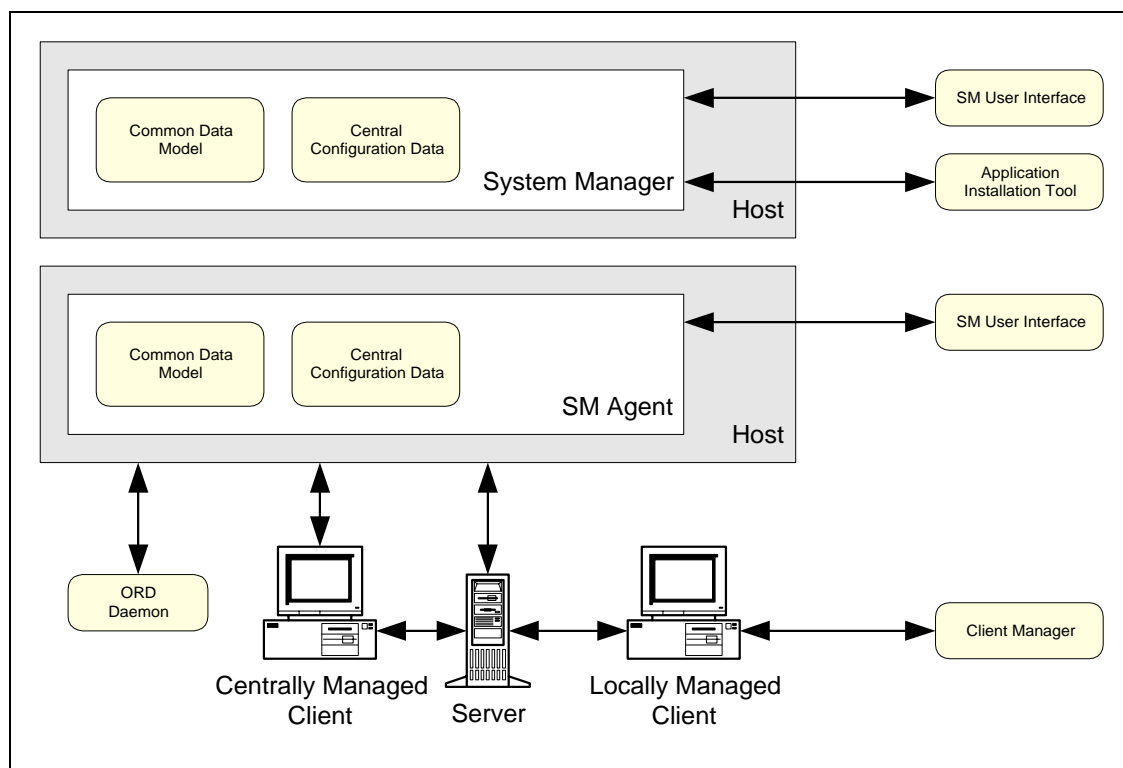


Figure 2 – Component Broker System Management

### 3.4 IBM eNetwork Dispatcher Monitoring Tool

A fully functional graphical user interface is provided for managing eNetwork Dispatcher (ND). The current configuration is represented on the left-hand side of the GUI as a graphical tree. At root level high level objects are represented such as the Dispatcher itself. Below this level are seen clusters, ports and servers, along with the Manager and Advisors. Each cluster port and server can be selected, as can the manager and advisors. A context menu is also provided.

Appropriate dialogs are presented when specific options are selected. A status display area at the bottom of the GUI and full online help via a browser bean are provided. This graphical tree includes the capability to show and manage multiple dispatcher configurations on a single GUI.

The GUI also provides several options for real-time graphical displays of the statistics of port or server performance, including 3D views of several ports or servers at once.

## 4 Data Warehouse Operations Environment

The Data Warehouse Operations Architecture provides an environment to support the operations management process required for the applications that comprise the data warehouse environment.

### 4.1. Informatica Operations Environment

#### 4.1.1. PowerCenter Server Manager

The PowerCenter Server Manager is the application that enables the user / developer to create, schedule, monitor, and performance tune sessions. Either the Server Manager or the command line program “*pmcmd*” is used to start a session. A session can be configured to run on demand, or to run on a set schedule.

#### 4.1.2. PowerCenter Repository Manager Module

The PowerCenter Repository is the metadata integration hub of PowerCenter 1.7. Users gain access to the metadata stored in the repository through the Repository Manager and the Metadata Browser. The Repository Manager is used to create and maintain the PowerCenter repository and its metadata

### 4.2. MicroStrategy Administrator

MicroStrategy Administrator provides a Warehouse Monitor application that can monitor and track the various projects and application built on the MicroStrategy Platform. Warehouse Monitor allows administrators to monitor and track user connections, project usage patterns, report usage patterns, report object cache, and reporting queues. With Warehouse Monitor, administrator can maintain and often improve the overall system performance.

MicroStrategy Administrator also allows for the transfer of user reporting objects. Reporting objects owned by one user can be copied or moved so that they are accessible to user groups or to all users.

## 5 EAI Architecture Operations Environment

Operations management of the Enterprise Application Integration (EAI) Architecture will be performed using third party tools and standard tools that are provided by IBM MQSeries Messaging, MQSeries Integrator Version 2.0, and MQSeries Workflow. Operational tasks within the EAI environment may include:

- Startup and shutdown of the EAI application
- Troubleshooting
- Scheduled and unscheduled maintenance
- Upgrades
- System monitoring

### 5.1. EAI Management with QPasa!

The EAI management will be performed using the QPasa! product. QPasa! is a middleware management software that addresses all five critical areas of configuration, operations, problem-detection, performance, and analysis. QPasa! may be used to support MQSeries Messaging, MQSeries Integrator and MQSeries Workflow.

### 5.2. MQSI System Administration

Key systems administrative functions for MQSI include:

- Administration of MQSeries Integrator components
- Implementation of security options that can be put in place
- Monitoring the MQSeries infrastructure

Once MQSeries Integrator has been installed, facilities are provided to help configure and administer the broker domain and its components.

The tasks and facilities for component administration include:

- Configuring the broker domain
- Managing the broker domain
- Problem determination
- System management

#### 5.2.1. Configuring the broker domain

The configuration tasks are:

- Create, modify, and delete the Configuration Manager

- Create, modify, and delete brokers
- Create, modify, and delete the User Name Server.

### **5.2.2. Managing the broker domain**

The tasks for managing the broker domain are:

- Start and stop brokers
- The Configuration Manager
- The User Name Server
- List components, and some resources, on the local system

### **5.2.3. Problem determination**

MQSeries Integrator provides facilities that help to understand what is going on in the broker domain, and to track activity and make changes. These facilities support the following tasks:

- Start and stop tracing for components and sub-components
- Retrieve and format log records

### **5.2.4. System management**

MQSeries Integrator provides facilities that assist in centralized system management. These facilities support the following tasks:

- Monitoring of the status and activity of MQSeries Integrator system components (brokers, the Configuration Manager and the User Name Server). For example, reports are generated whenever a broker starts or stops
- Monitoring of the status and activity of execution groups
- Monitoring of the status and activity of message flows



## 6 Acronyms

Table 3 – List of Acronyms

Acronym	Description
ACL	Access Control List
AFS	Andrew File System
CB	Component Broker
CSC	Computer Sciences Corporation
EAI	Enterprise Application Integration
FTP	File Transfer Protocol
GUI	Graphical User Interface
HTML	Hypertext Markup Language
IBM	International Business Machines
IP	Internet Protocol
IT	Information Technology
ITA	Integrated Technical Architecture
JSP	JavaServer Pages
ND	Network Dispatcher
OLD	Object Level Debugging
OLT	Object Level Trace
RDBMS	Relational Database Management System
SFA	Student Financial Assistance
TBD	To Be Determined
TCP	Transmission Control Protocol
UPS	Uninterruptible Power Supply
VDC	Virtual Data Center
VIC	Viador Information Center
VLDB	Volume Location Database